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NATIONAL GUARD SOLAR POWER PROJECTS

By Dr. JoAnne Castagna

President Barack Obama said during his inauguration speech on 20 January 2009, "We will harness the sun and the winds and the soil to fuel our cars and run our factories." Mr. Obama and the new administration believe that renewable energy is part of our nation's successful future, possibly because the federal government has already experienced positive results in this area. Under the federal government's Energy Policy Act of 2005, all federal government agencies are required to use some renewable energy. One agency that is continuing to do this successfully is the United States Army National Guard, with the assistance of the United States Army Corps of Engineers (USACE).

Recently the New Jersey Army National Guard sought the expertise of the USACE New York District for construction of two solar power projects. These projects will not only

help the Guard meet the country's energy laws but also save money on electricity and earn a profit from the state of New Jersey, which requires its citizens to support the use of renewable energy. Each year, solar system owners who generate more than 1,000 kilowatts of electricity that is connected to the public power grid receive certificates under the New Jersey Solar Renewable Energy Certificate (SREC) Program. These certificates are then publicly sold and traded to New Jersey businesses and individuals, enabling them to receive solar power benefits without building a solar power system themselves. The revenue is returned to the solar system owners.

The New Jersey National Guard is an owner of several solar power systems. They will continue to benefit from the SREC Program with the assistance of USACE, which is constructing two open-panel photovoltaic carport solar



Photo by Armando Jimenez, U.S. Army Corps of Engineers, New York District.

An example of solar power panels on a photovoltaic carport project at the Atlantic City Utility Authority in New Jersey (not constructed by USACE)

power projects for the New Jersey National Guard—one for their agency's Joint Forces Headquarters at Fort Dix and the other for their National Training Facility Headquarters at Sea Girt. To power these two buildings, USACE is erecting the carport structures over two existing parking lots at both locations and then setting up area lighting, inverters, transformers, switchgears, and electrical metering equipment. When the projects are completed, USACE will restore the parking lot pavement (which is already in good shape) by restripping and sealing cracks.

Supported by web steel joists and joist girders, the steel carport structures will have solar photovoltaic power panels—composed of modules—installed on top. Each module is made up of several solar (or photovoltaic) cells that absorb the sun's light and produce electricity—the larger panels producing more. The electricity is in the form of direct current (DC), which is not directly usable energy for a building. Most buildings require alternating current (AC) at a higher voltage. To make usable building power, the solar panel's DC is fed into an inverter that transforms it into AC at a higher voltage. This AC power is then sent to the building's main transformers, where it can be used by the buildings for their energy needs. The New Jersey National Guard's solar power system is tied into the public's power grid, and excess power is shared with the community.

When completed, both structures—including the panels—will be roughly the size of a football field. The Fort Dix project will generate approximately 240 kilowatts, and the Sea Girt project, approximately 238 kilowatts. Both projects are also being designed in a way that will provide the National Guard considerable energy savings during the high-energy-demand months of summertime. At Fort Dix, the panels are being angled for optimum performance. This will provide the Fort Dix building 40 percent of its summer energy needs and the Sea Girt building will provide 80 percent. Placing the panels on an angle also facilitates runoff of rain and snow.

The New Jersey National Guard will earn considerable money from electric bill savings and the state's SREC Program. In total, the Guard will save approximately \$116,000 per year in electric bills and earn approximately \$350,000 from the SREC Program. Besides these financial benefits, there are additional pluses that come with constructing solar power projects on new open-panel carports on existing parking lots.

Anyone installing a solar power system on an existing building roof, rather than a new roof, will typically have to remove the panels later to repair the roof as it gets old and leaks, which can be very expensive and time-consuming. The solar power system will also add weight or roof load to the existing roof, increasing its deterioration. As the project manager for the USACE New York District emphasizes, a roof may only have one year left, making it impractical to install panels atop it that can last 20 to 25 years. Additionally, placing panels on new roofs makes it unnecessary to acquire building or roofing permits to reinstall roof-mounted solar power systems.

Constructing on existing parking lots also has its benefits. For example, since storm water runoff isn't affected, there are minimal impacts to the environment. In addition, vehicles using the parking lot receive some shading from the sun. An open-panel carport design, as opposed to a solid ceiling structure, is a smart solution, since it prevents debris such as bird nests and snow from accumulating on the carport—which would require regular maintenance. In addition, a solid ceiling adds weight to the structure, requiring a stronger and more expensive structural support.

The project manager for the USACE New York District envisions an increase in solar power project construction and has the following suggestions for builders:

- Before beginning a solar power project, seek advice from experts in solar and renewable energy, because they can help save considerable time and money. In the projects highlighted here, the USACE New York District collaborated with the USACE Engineer Research and Development Center, which has extensive experience working on solar power projects with USACE districts, the Department of Defense, and other federal agencies throughout the world.
- When designing a project, make sure the buildings to be provided with solar power are large enough to use most of the energy, or have a "big load," and are situated near the solar power panels. The farther a building is from the panels, the more energy it will take to transport the solar power energy to the buildings, resulting in lost efficiency. For example, solar power panels far out in a desert are impracticable; energy is always wasted when transporting power, since power transmission lines have inherent resistance and capacitance.
- Calculate ahead of time how much money customers will be saving in electric bills in the long run and find out if there are any energy credit programs they can benefit from, such as the state of New Jersey's SREC Program, so that the project is economically justified.

Both solar power projects are expected to be completed by this summer, and according to the New York District project manager, the New Jersey Army National Guard has asked USACE to perform additional solar power projects in the near future—all of which will help meet the nation's environmental goals and the President's renewable energy vision.

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